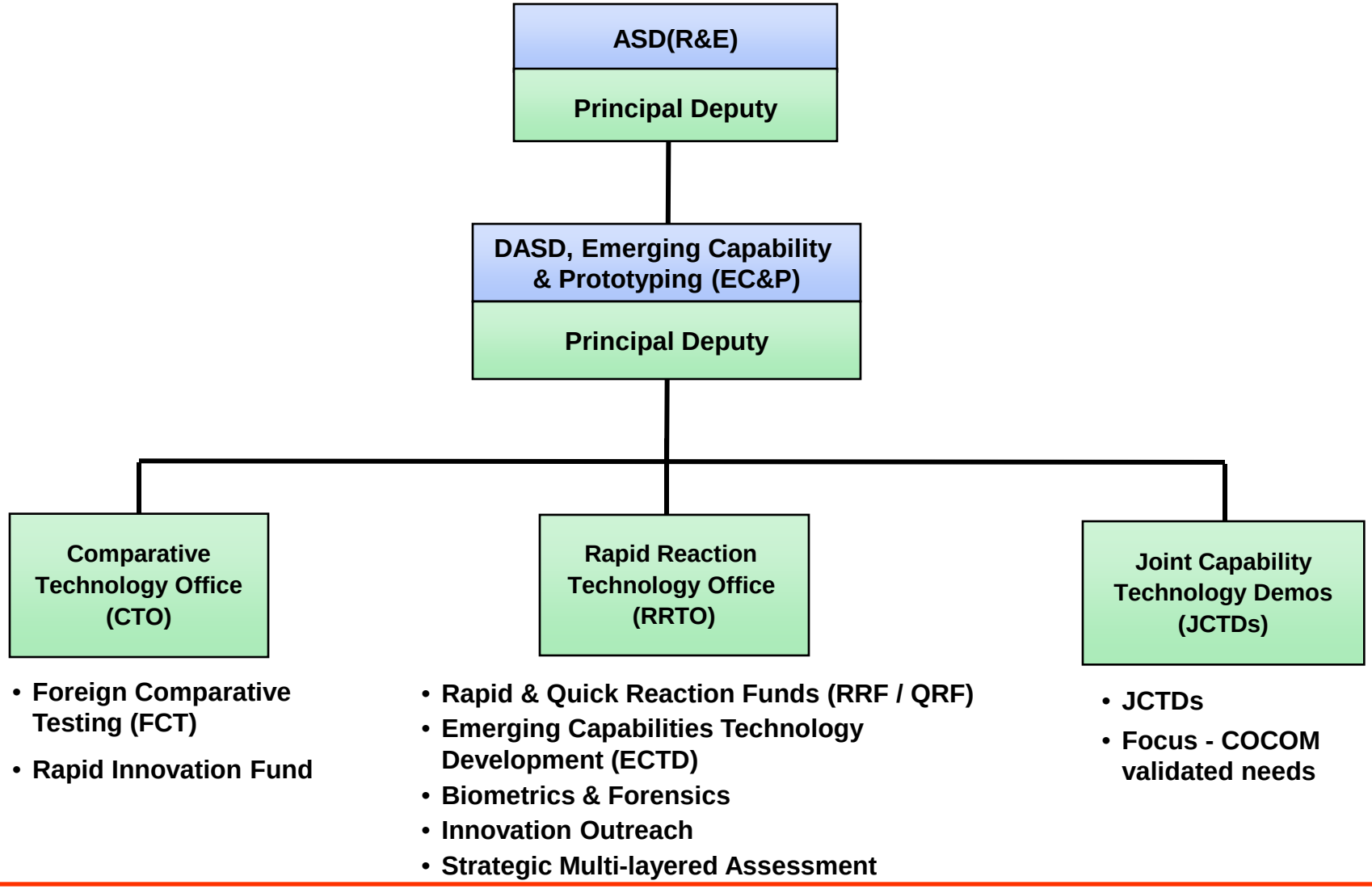
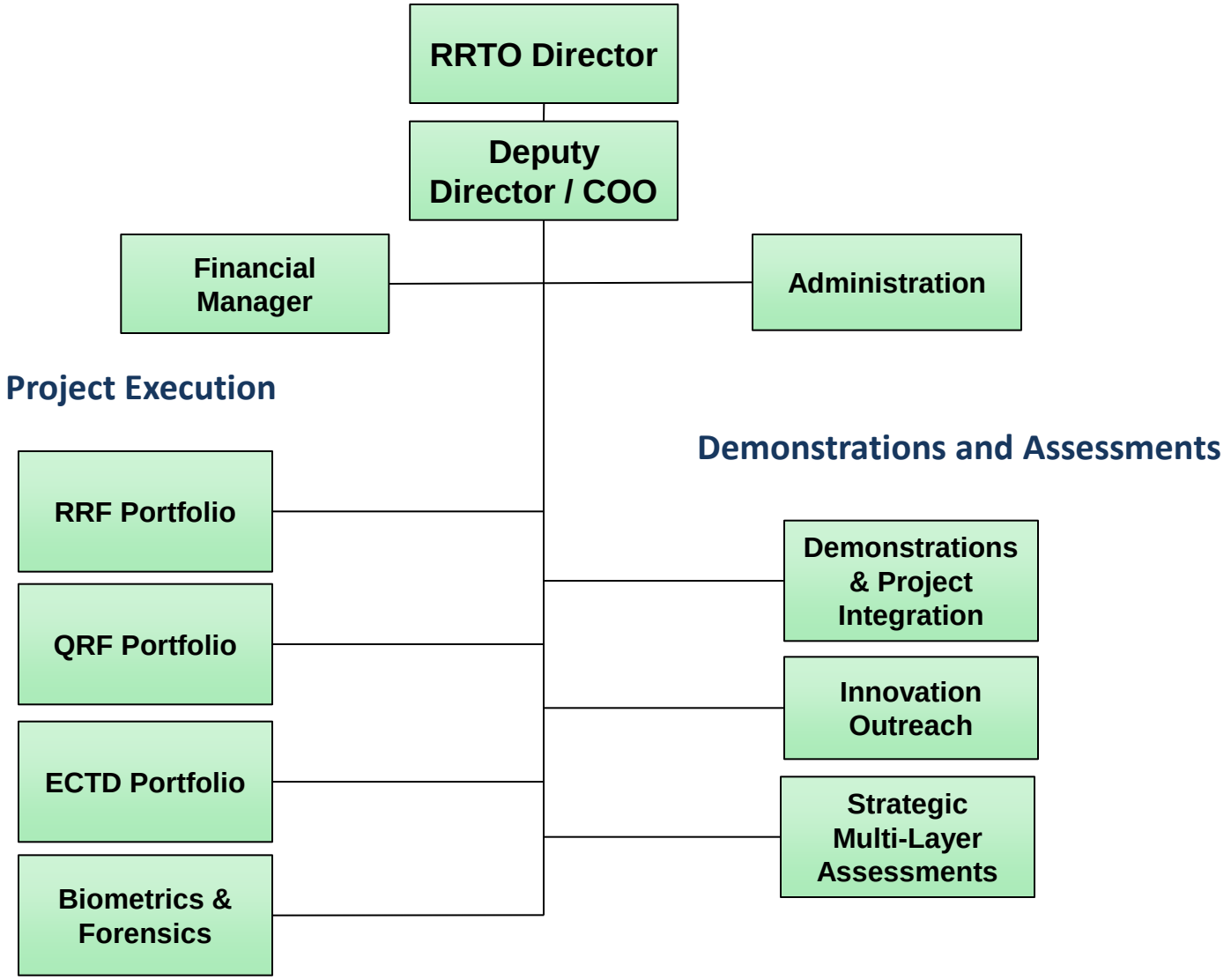
Rapid Reaction Technology Office (RRTO)

Overview

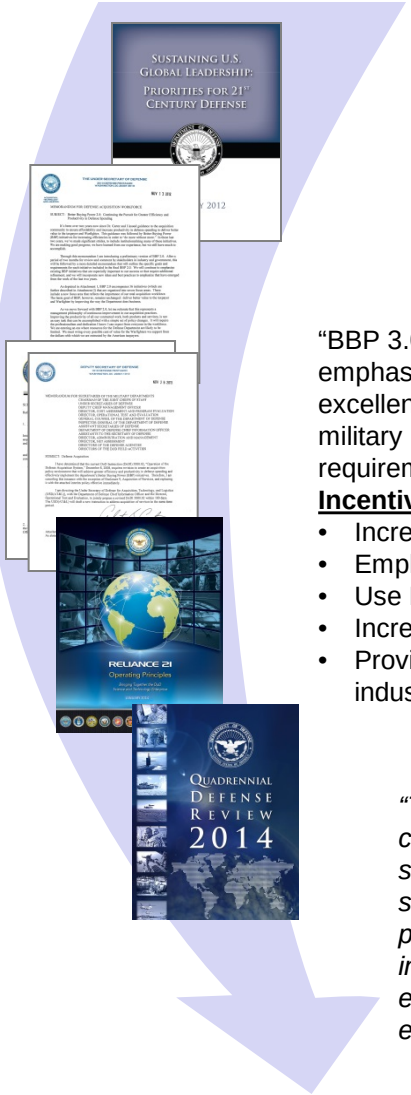
Emerging Capability & Prototyping Directorate



RRTO Organizational Structure



Strategic Guidance



Quest for agility, innovation, and affordability

"As we end today's wars and reshape our Armed Forces, we will ensure that our military is agile, flexible, and ready for the full range of contingencies."

"This country is at a strategic turning point after a decade of war and, therefore, we are shaping a Joint Force for the future that will be smaller and leaner, but will be agile, flexible, ready, and technologically advanced."

– Sustaining US Global Leadership: Priorities for the 21st Century Defense

"BBP 3.0 continues the focus on continuous improvement with a new emphasis on initiatives that encourage innovation and promote technical excellence with the overarching goal of ensuring that the United States' military has the dominant capabilities to meet future national security requirements."

Incentivize Innovation in Industry and Government

- Increase the use of prototyping and experimentation
- Emphasize technology insertion and refresh in program planning
- Use Modular Open Systems Architecture to stimulate innovation
- Increase the return on Small Business Innovation Research (SBIR)
- Provide draft technical requirements to industry early and involve industry in funded concept definition to support requirements definition

– Better Buying Power 3.0

"When there is a strong threat-based or operationally driven need to field a capability solution in the shortest time, MDAs are authorized to implement streamlined procedures designed to accelerate acquisition system responsiveness. Statutory requirements will be complied with, unless waived in accordance with relevant provisions."

– DoDI 5000.02, January 7, 2015

"The goal of Reliance 21 is to ensure that the DoD S&T community provides solutions and advice to the Department's senior-level decision makers, warfighters, Congress, and other stakeholders in the most effective and efficient manner possible. This is achieved through an ecosystem and infrastructure that enables information sharing, alignment of effort, coordination of priorities, and support for scientists and engineers across the Department."

– Reliance 21, January 2014

"Staying ahead of security challenges requires that we continue to innovate, not only in the technologies we develop, but in the way the U.S. forces operate. Innovation – within the Department and working with other U.S. departments and agencies and with international partners – will be center stage as we adapt to meet future challenges."

– Quadrennial Defense Review 2014

Top Level Guidance

- **ASD(R&E) Imperatives**
  - Mitigate emerging threats
  - Enable new capabilities
  - Affordably extend life of existing systems
- **ASD (R&E) Focus Areas**
  - Autonomy
  - Electronic Warfare
  - Space Resiliency
  - Counter-WMD
- **DASD Emerging Capability & Prototyping**
  - Operational Prototypes
    - Demonstrate military utility of integrated solution
    - Demonstrate robust manufacturing processes
    - Define forum, fit and function
  - Proof-of-Principle Prototypes
    - Demonstrate feasibility of an integrated capability
    - Overcome technical risk
    - Develop data to enable cost-capability trade

RRTO Mission and Vision

"As other nations pursue comprehensive military modernization programs and develop technologies designed to blunt our military's traditional advantages, the first pillar of our future force must be ensuring that we maintain – and extend – our technological edge over any potential adversary."

Secretary of Defense Ash Carter, before the Senate Appropriations Committee, May 6, 2015

- **RRTO Mission**
  - RRTO will develop prototypes and host technology demonstrations to counter emerging and anticipated threats in order to accelerate the delivery of resilient solutions leading to affordable Warfighter capabilities.

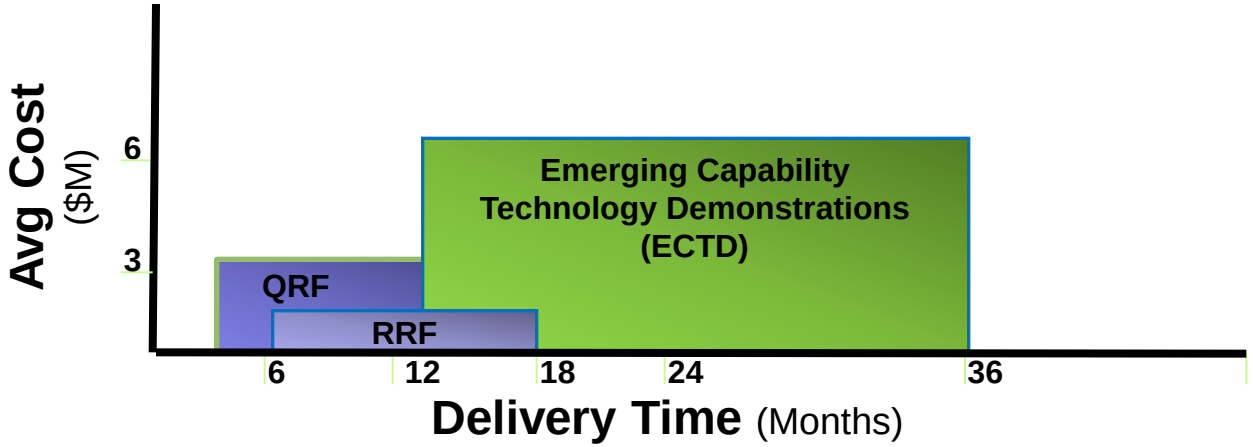
- **RRTO Vision**
  - RRTO is the model for developing and demonstrating less mature, high-reward technologies that produce game-changing capabilities by leveraging non-traditional sources of innovation, interagency partnerships, and rapid prototyping.

RRTO Overarching Objectives

- Identify and examine technological impacts of emerging and potential future military issues
- Anticipate adversaries' (Red Team) future exploitation of technology
- Leverage the DoD science and technology base and those of other Federal Departments
- Identify and leverage technology developed outside of DoD in the commercial sector, in academia, and internationally
- Regularly engage with innovators and communities of interest to keep abreast of emerging technologies, threats, and Warfighter needs
- Support ASD(R&E) and DASD(EC&P) overarching objectives
- Stimulate interagency coordination and cooperation
- Demonstrate feasibility of integrated or cross-domain capabilities that guide long-term science and technology investment decisions
- Provide evidence based metrics & measures in overcoming specific technical risk barriers
- Accelerate maturation of affordable, resilient capabilities and concepts to counter emerging threats
- Execute projects to support irregular and conventional warfare needs

RRTO Funding Lines

- **Rapid Reaction Fund (RRF):** Provide hedge against technology risk
  - Identify and develop near term capabilities to support irregular warfare needs
  - Completion of efforts within 6-18 months
  - Actively seeks partnership opportunities with DoD and non-DoD partners
- **Quick Reaction Fund (QRF):** Accelerate conventional warfare capabilities
  - Identify and develop near term capabilities to support conventional warfare needs
  - Requirement for completion of efforts within 12 months of funding
  - Deliver a hardware prototype to demonstrate capability
- **Emerging Capabilities Technology Development (ECTD):** Counter emerging threats
  - Identify and develop prototypes to counter emerging threats
  - Longer-term (12-36 months), mission-focused capability development that crosses functional domains and enhances the Warfighter's adaptability and resilience



RRTO Execution Approach

- **RRTO develops joint projects and activities with DoD organizations and interagency partners**
  - Interagency partnerships are informal and are built on established working relationships
  - Partners include:

Department of Homeland Security	Department of State
Department of Justice	Department of Commerce
Director of National Intelligence	Central Intelligence Agency
National Security Agency	National Reconnaissance Office
National Geospatial-Intelligence Agency	Director, National Intelligence
Technical Support Working Group	Academic institutions and industry partners

- **RRTO projects support a wide range of operational users:**

– EUCOM	CENTCOM	AIR FORCE
– PACOM	SOCOM	ARMY
– NORTHCOM	SOUTHCOM	NAVY/MARINE CORPS

- **RRTO also creates venues for informing interagency programs of interest and partners of its activities**
  - Bi-annual Cross-Pollination Meetings
  - Strategic Multi-layered Assessment Conferences
  - Demonstration Venues and Spiral Exercises

Biometrics and Forensics Science & Technology

Outcomes

- Counter emerging threats to DoD's biometric/forensic capabilities
- Improve the completeness, accuracy, and/or timeliness of biometric and forensic information
- Reduce the cost and/or footprint of biometric and forensic technologies

Focus Areas

Data Analysis—Managing, interpreting, fusing, and/or synthesizing the data produced by biometric and/or forensic analysis

Automated or Remote Systems—Automating the recognition, collection and/or analysis of biometric and forensic materials

Non-Compliant Collections—Collecting biometric and/or forensic materials against active efforts to hide or prevent collection

Standoff Collection—Collecting biometric and/or forensic materials from a distance in an overt manner

Personnel Accounting—Improving forensic capabilities that support the identification of remains recovered from previous conflicts

Counter-Counter Biometric/Forensic Technologies—Thwarting threat efforts to reduce DoD biometric/forensic effectiveness

Approaches

- Identify and define end user problems and develop technical approaches before identifying solutions
- Work closely with interagency, industry and academia partners to shape RDT&E activities; solicit joint funding from DoD and interagency partners
- Invest in projects with a clear transition path to end users
- Leverage Defense Forensics and Biometrics Agency Broad Area Announcement to fund RDT&E projects

Rapid Reaction Technology Office (RRTO) Innovation Outreach

- **RRTO uses the Innovation Outreach approach to access and leverage technology developed outside the purview of the DoD**
  - **Innovation Outreach Workshops** help identify commercial technologies from small and non-traditional businesses responding to public solicitations on FedBizOpps.gov

Develop Needs
Identify Sponsor & publish needs as special notice on FedBizOpps

→

Identify Companies
Interested companies submit tech overview via FedBizOpps

→

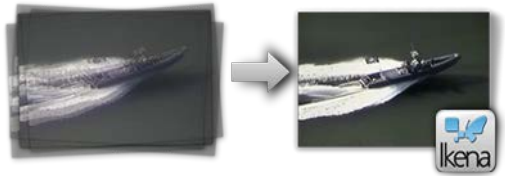
Present Solutions
Companies with most promising solutions brief potential users

→

Technology Solutions
Experimentation / demonstration with follow-on acquisition

  - **The Innovation Outreach process has resulted in:**
    - 448 of 2,427 companies identified through FedBizOpps presented briefs to government reps
    - 46 companies funded for experimentation / demonstration
    - 16 capabilities operationally fielded
  - **Successes:**

FireEye: A network security company that provides automated threat detection and dynamic "day zero" malware protection against advanced cyber threats. RRTO Innovation Outreach supported an evaluation of the FireEye capability shortly after its founding in 2009. Subsequently the Air Force Electronic Systems Center and Army CERDEC have procured FireEye software. FireEye is currently a publicly-traded company valued at more than $3B.



MotionDSP: Software-only solution for full motion video that provides real-time super resolution, de-cluttering, vibration/jitter correction and noise reduction on mid-low end laptop computers. The Defense Intelligence Agency's National Media Exploitation Center (NMEC) and the National Geospatial-Intelligence Agency (NGA) have operationally fielded the technology. The Air Force has also funded MotionDSP to improve the quality of Air Force surveillance camera feeds.

"Remove barriers to commercial technology utilization."
Under Secretary of Defense for Acquisition, Technology & Logistics Frank Kendall, Better Buying Power 3.0

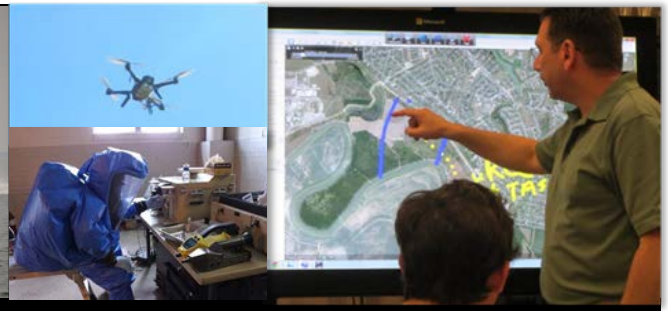
RRTO Demonstration Venues

Multi-Domain Demonstrations

Multi-Domain Demonstrations leverage existing demonstration venues and sites within RRTO and across the military Services to evaluate emerging technologies and prototypes at the system and individual component levels. Demonstrations focus on integrating emerging capabilities across space, air, sea and ground domains, giving non-traditional businesses easy access to realistic environments. For example, RRTO has sponsored testing of more than 300 systems at the Joint Experimental Range Complex (JERC) at the Yuma Proving Grounds since 2003.

High Speed, Electronic Keel Marine Testbed

Stiletto is a high speed vessel with an "electronic keel" that will support a wide range of equipment. The 88-foot long boat is an experimental, all carbon fiber craft that was designed to rapidly acquire, integrate, and employ new capabilities to explore the military utility of emerging technologies and concepts for special and expeditionary forces. Stiletto participates in coordinated exercises and technology assessments with the direct involvement of military commands, Services and interagency partners. In FY 2014, Stiletto demonstrated 110 technologies, providing a total cost savings of $11.7M and transitioning 12 technologies to operational PORs.



Multi-Intelligence & ISR Technology Demonstration Venue

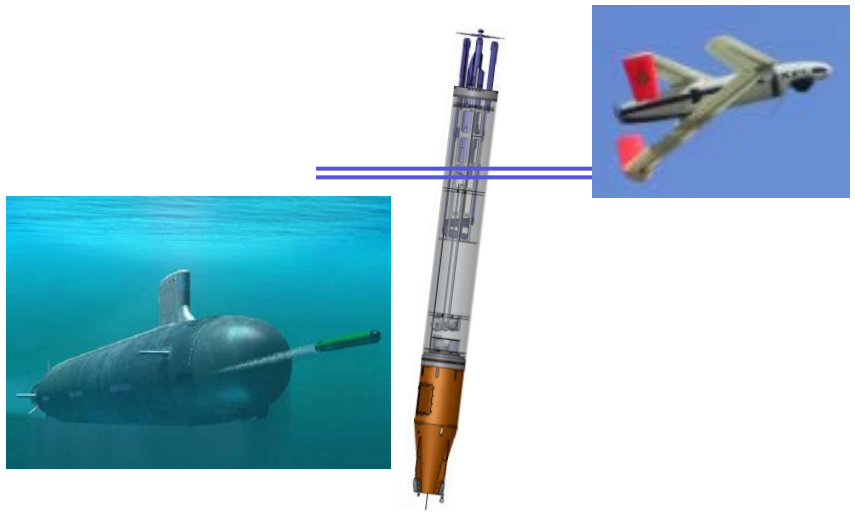
Thunderstorm provides OSD, interagency partners, Combatant Commanders, Services, academia, government laboratories and commercial vendors with an enduring multi-Intelligence technology demonstration venue. New and existing ISR technologies can be integrated, evaluated and assessed under real world conditions with scripted and unscripted scenarios. Thunderstorm spirals are conducted twice a year. In FY 2014, 36 technologies were demonstrated, and 12 of those systems were referred to operational partners for follow-up or potential acquisition.

Backup

RRTO Project Examples

XFC/Sea Robin:

This effort developed and demonstrated a long endurance, stealthy Unmanned Aerial System equipped with high quality, real-time or stored video, capable of being launched from a submerged submarine. XFC provides submarines with an extended reach collection device.



I-CAT: A conceptual design for an inflatable catamaran with three mutually supporting components: inflatable hulls, a collapsible frame, and an integrated topside. The study demonstrated the concept by fabricating both inflatable and rigid hulls to demonstrate performance, and a basic rigid aluminum frame to form a catamaran craft with the hulls. The project has transitioned to become the Combatant Craft Light Mark 1 program.

RRTO Project Examples

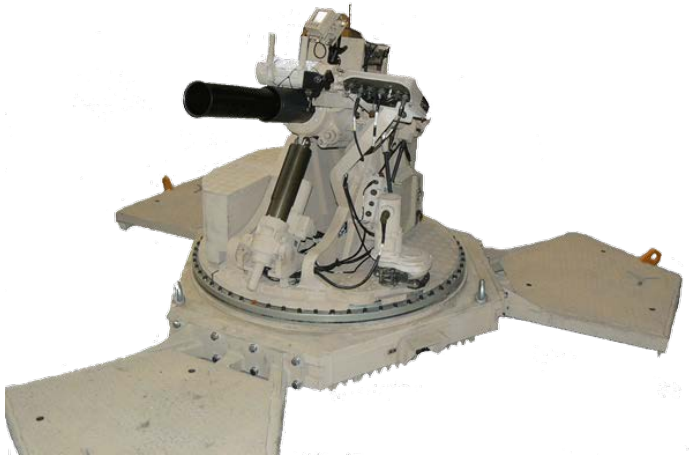
iClamp: Provides combat medics, first responders and emergency room triage personnel with a novel hemorrhage control technology that stabilizes wounded persons until emergency room care is available. iTClamp closes open wounds, stops critical bleeding in seconds, and one-handed operation allows for self-placement.

Standoff AUV collection in shallow or denied areas with host submarine

Project 1319: Provides covert extended Warfighter reach into littoral, shallow water or denied areas. It supports safe and efficient homing and docking between an Autonomous Underwater Vehicle (AUV) and submarine. Demonstrates high data rate digital acoustic communications and ultra-short baseline acoustic tracking. A prototype will operationally deploy in FY 2015.

RRTO Project Examples

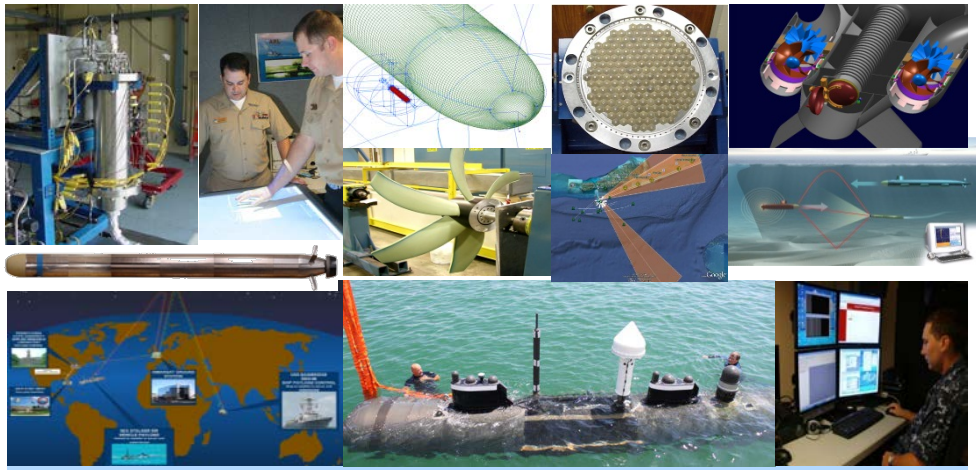
Advanced Mortar Protection System (AMPS): AMPS is an accurate system for providing precise 120mm indirect fire capability in 360 degree direction. AMPS was fielded with U.S. Forces-Afghanistan in support of Operation Enduring Freedom in FY 2014.



Accelerated Nuclear DNA Equipment (ANDE): Enables automated rapid DNA profiling, while minimizing analytical complexity and user manipulations, for field applications. System prototypes allow users without technical training to generate DNA profiles directly from buccal swab reference samples in approximately 90 minutes.

RRTO Project Examples

NAUTICAS is a short-range stand-off system which allows the contents of a submerged object to be examined without touching or opening the object. The technique allow threat materials, contained inside of the object to be easily and readily identified even if they are surrounded by intentional shielding, layers of “benign” materials.



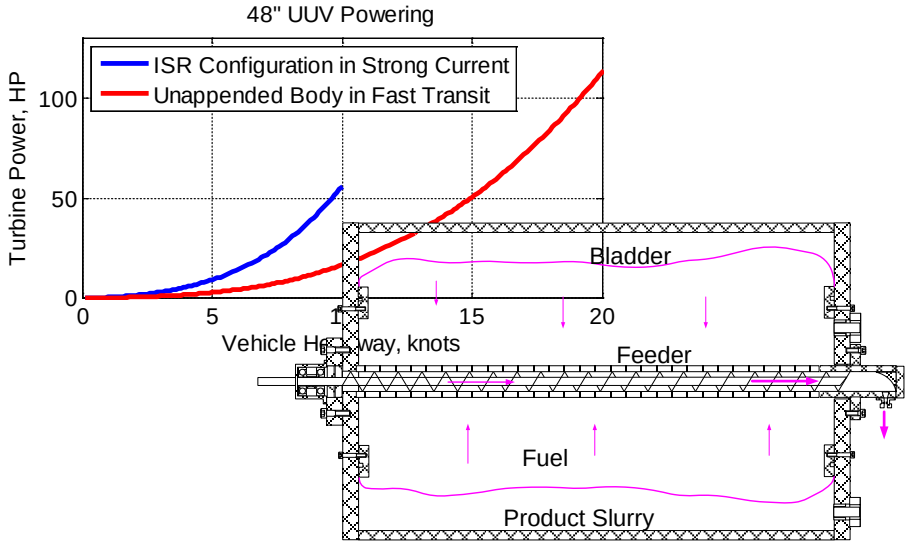
Preparing our future leaders for a rapidly evolving technology landscape

UUV Short Course: The course establishes a basic understanding of the technological “art of the possible” of undersea technology through a combination of lectures, technology demonstrations of prototype hardware and visualization of the key technology trade-offs. By educating promising junior officers today, we ensure that future decision-makers will possess the technology background necessary to understand the technology trade-offs and make good investments to maximally exploit the unique features of the undersea domain.

RRTO Project Examples

Perseus: A DoD effort supporting Science, Technology, Engineering, and Mathematics (STEM) education by enabling undergraduate students to apply multidisciplinary engineering skills to accomplish a realistic mission. Missions have included disrupting underwater cables and identifying and characterizing underwater unexploded ordnance.

Conventional Effects Via Unconventional Means



Aluminum Combustor: Develops a fuel-feed system for an aluminum-combustion powered high-performance Unmanned Underwater Vehicle. ISR, SOF support and track-and-trail are typically regarded as the mission types that will benefit most from the enhanced capability provided by aluminum combustion power.

LUUV Ops are Energy Intensive -- Al-H_2O is a Game Changer